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HEARING PROTECTION AND HEARING SYMPTOMS IN DANISH SYMPHONY ORCHESTRAS

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ABSTRACT

A study about hearing protectors, problems involving hearing protector usage, hearing problems and working surroundings of classical musicians was made in three Danish symphony orchestras. The questionnaire used in the study was based on a previous study, a study made in Sweden to rock musicians, and a questionnaire used in researching occlusion effect with hearing aid users. Also a section from an EQ-5D- questionnaire (a standardised instrument for use as a measure of health outcome) was included to the study.

Orchestras were visited by the authors and informed about hearing protection, hearing loss, and ear symptoms. 146 musicians filled out the questionnaire.

Results show that musicians wear hearing protectors to some extent but their usage can be irregular and hearing protector is sometimes used in one ear only. Musicians worry about their hearing. The more ear symptoms musicians have, the more they use hearing protectors. Musicians suffer from different kinds of ear symptoms, and musicians with symptoms have more stress, and seem to have inferior quality of life to colleagues without symptoms. Musician's hearing conservation is thus a complicated matter and further research is needed.

1 INTRODUCTION

The sound exposure of classical musicians has been studied for more than 40 years, and researches do still not agree about whether the measured high sound levels in symphony orchestras are as harmful as industrial noise of same energy to musicians [1]. The audiograms of the musicians do not always show hearing loss consistent with the exposure [2]. The hearing thresholds and sound levels of Nordic orchestras have been studied in other studies as well [3 and 4].

Compared to the working environment of a musician the demands for hearing conservation are quite different from the case of industrial noise. Therefore the information about sound exposure and hearing loss must be supplemented by other aspects of the working conditions.

One of the aims of the present investigation is to examine the use of hearing protectors in symphony orchestras as the new EU directive about noise at workplace [5] will include musicians. The aim of the study is also to investigate the prevalence of self-reported ear symptoms among musicians, the importance of these ear symptoms to the musicians, the usage of hearing protectors and especially difficulties in the usage.

The questionnaire used in the present study was based on a number of questionnaires used in previous studies made in Finland [6], Sweden [1], and Denmark [7]. Also a section from the EQ-5D- questionnaire [8], a standardized questionnaire for use as a measure of health outcome, was included in the present study.

2 MATERIAL AND METHODS

Three major Danish orchestras took part in the investigation. The orchestras were visited by the authors and informed about hearing conservation. The questionnaires were given to the orchestra members who filled in the questionnaire on location. In total 146 musicians attended the lectures. One respondent was rejected from the subsequent analysis due to very insufficient data. All answers were given anonymous.

The orchestras and the number of members in each orchestra were as follows: South Jutland Symphony Orchestra (66 musicians), Aalborg Symphony Orchestra (65 musicians), and Aarhus Symphony Orchestra (72 musicians).

The questionnaire consisted of 91 questions. Of these 27 questions were open answer questions, and the rest were multiple-choice questions. The questionnaire was divided into sections: General, Hearing protection and sound level reduction, Occlusion effect, Health related questions, Work surroundings, and Rehearsal and performance facilities.

The total percentage of the musicians who responded was 68 % of the total number of orchestra members. Gender: 61 % of the answers were from men, and 39 % from women. The questionnaire data was analyzed using SPSS 9.0. In order to ensure anonymous responses, the responses from the three orchestras are pooled and analyzed as one group.

3 RESULTS

3.1 The usage of hearing protectors

Table 1 gives the usage rates of hearing protectors. The usage rates are lowest at personal rehearsals and at teaching, and slightly higher at orchestral rehearsals and performances. Only 13 % got used to hearing protectors right away, for 15 % it took some time, 43 % are not used to use hearing protectors but uses them anyway and 29 % quitted the use of hearing protectors because it was too difficult.

Table 1. Hearing protector usage at personal rehearsals, orchestral rehearsals, performances, and teaching

Usage (% of respondents)	Never	Seldom	Sometimes	Often	Always
At personal rehearsals	84	7	6	2	2
At orchestral rehearsals	39	31	18	8	5
At performances	48	31	11	7	4
While teaching	94	1	5	0	0

Hearing protectors were used in both ears by 49 %, 35 % used them only in one ear and for 16 % it depended on the situation. Whether the musicians use hearing protector on the left or right ear depends mostly on the direction to the loudest sound source. Only violinists used more often one hearing protector on the left ear. Few musicians (15 %) used hearing protectors constantly, and the majority (83 %) used them only now and then. Of the musicians who did not use hearing protectors continuously, the majority responded that they use them only during loud passages, or when sitting near loud instruments. Other situations to use hearing protectors were when being tired, or playing contemporary music. Some took their hearing protectors off when the conductor or colleagues were speaking, during breaks, or when playing difficult passages.

The analysis showed that hearing protector usage was related to temporary ringing in the ears and independent on the playing condition (personal, orchestral rehearsals, and performances). Additionally there was a correlation between being worried about hearing, considering rehearsals and performances being noisy, and using hearing protectors at orchestral rehearsals, and performances. There was no correlation between stress and the usage of hearing protectors.

Problems in hearing protector usage were listed (by 84 musicians) as follows (from pre-written choices): difficult to hear other's playing (82 % of the responses), hindering own performance (76 %), uncomfortable (52 %), difficult to put into the ears (30 %), feeling of pressure from the earplugs (23 %) and other (10 %).

3.2 Ear symptoms

Ear symptoms that can affect musician's work were examined. The symptoms were: tinnitus, hyperacusis, distortion and diplacusis. The distribution of different ear symptoms is

given in table 2. Self reported hearing loss was present in 27 % of the men and 28 % of the women (not shown in table 2).

Table 2. Ear symptoms in orchestras (n=number of musicians, percentage is of all musicians who answered the question)

	Tinnitus n (%)	Hyperacusis n (%)	Distortion n (%)	Diplacusis n (%)
ALL	34 (24)	33 (25)	15 (12)	6 (5)
Women	10 (18)	16 (31)	7 (14)	3 (6)
Men	24 (27)	17 (21)	8 (11)	3 (4)

In order to see any correlations between ear symptoms and other variables, a Kendall's tau_b analysis was used. Self reported hearing loss was included as a symptom in this analysis. The ear symptoms were combined into one variable. Each symptom adds one unit to the variable, for example if a person has tinnitus and hyperacusis, the variable would have the value of two. The minimum would thus be zero (none of the symptoms), and maximum five (the person would have all the symptoms). None of the musicians had all the symptoms. The analysis showed that the more hearing symptoms a musician has, the more worried the musician would be about hearing, would have more stress, would experience the working surrounding as noisier, and would use more hearing protectors at rehearsals and performances.

Figure 1 shows the usage of hearing protectors at different playing conditions. The usage is shown for persons reporting different amount of ear symptoms. The answers were divided into groups of no symptoms, one symptom etc. up to four symptoms. The figure shows that the more symptoms an individual has, the more they use hearing protectors at personal and orchestral rehearsals and performances.

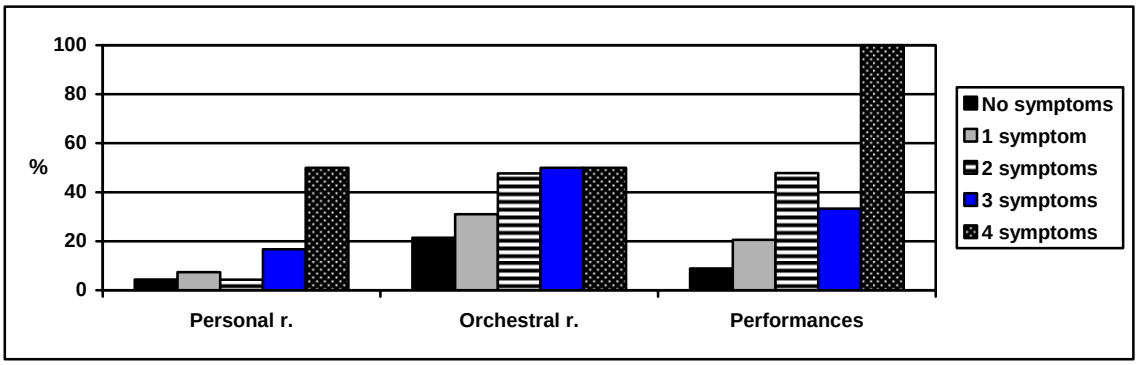

Fig 1. Hearing protector usage among musicians with no ear symptoms, or with one or more symptoms (percentages are a sum of the percentages of the answer to the usage question, and the sum comprises those musicians who used hearing protectors 'sometimes', 'often', and 'always')

3.3 Occlusion effect

Typical occlusion effect problems were inquired from the users of hearing protectors. The distribution of the problems was as follows (total 89 respondents, from pre-written choices): own voice sounds different (63 respondents), own instrument sounds different (88 respondents), I can hear my own breathing more clearly (35 respondents), sometimes I have a blocked feeling of my ears (34 respondents), I feel I have moist ear canals (11 respondents), and I feel my ear canals itch (19 respondents)

Many of the musicians have changed from one type of hearing protectors to another. They preferred custom moulded earplugs (10 respondents), HIFI plugs (7 respondents), cotton wool (7 respondents), and hearing aid, ear muffs, and foam earplugs (one respondent each) to the type they used earlier. The occlusion effect has caused 43 % of the users to quit hearing protector usage.

3.4 EQ-5D questionnaire

The results of the EQ-5D questionnaire were weighted with national population-based utility weights in order to get an index for two groups of musicians: those with ear symptoms and those without. Figure 2 shows the percentages of those musicians with the index being equal to 1 that is to say having the best possible quality of life in accordance to EQ-5D, and having ear symptoms. Figure 2 show that the percentages descend, i.e. the quality of life seems to be inferior for musicians with ear symptoms.

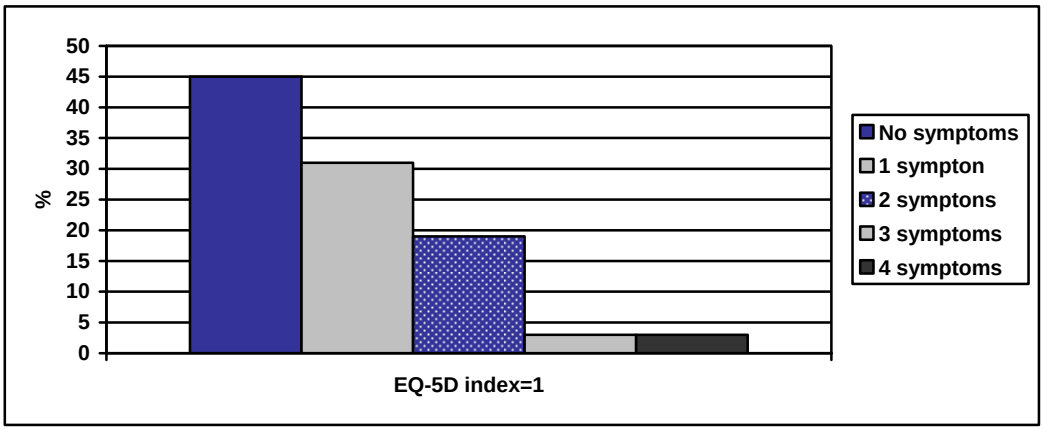

Fig 2. Percentages of those musicians having quality of life index=1 by EQ-5D and with no ear symptoms, or with one or more symptoms.

3.5 Working environment, working conditions

The musicians were asked about how noisy they felt the different playing situations. The musicians did not consider personal rehearsals noisy. Three % thought that personal rehearsals were quite noisy and none of them thought that personal rehearsals would be extremely noisy. Orchestral rehearsals were considered quite noisy by 27 %, and extremely noisy by 7 % of the players. Performances were considered quite noisy by 25 % and extremely noisy by 5 %. Teaching was also not considered to be noisy, only 3 % considered it quite noisy and none extremely noisy.

4 CONCLUSIONS

Musicians do not use hearing protectors on a regular basis. Surprisingly many musicians are using hearing protectors only in one ear. Also, most of the musicians are wearing the hearing protectors on/off during playing. Only 15 % reported that they use hearing protectors continuously. Others use them mostly only during loud passages. Getting used to hearing protectors is a slow process or virtually impossible for most of the musicians.

Those who use hearing protectors are also more worried about their hearing, consider orchestral rehearsals and performances noisier, and have more ear symptoms than musicians that do not use hearing protectors or use them only rarely. Difficulties in hearing protector usage were: difficult to hear others' playing, hindering own performance. Hearing protectors are felt uncomfortable by 52 % of the users, problems in fitting of the hearing protectors are present for 30 %, and feeling of pressure is felt by 23 % of the users.

The biggest problems caused by the occlusion effect are that their own voice sounds different, and that their own instrument sounds different. Though musicians acknowledge that there are differences between hearing protectors, the occlusion effect has caused 43 % of the users to quit hearing protector usage.

Correlations were found between ear symptoms and being worried about hearing, stress, hearing protector usage and noisiness of working surroundings. Also EQ-5D results seem to show a tendency of worsened quality of life for those musicians having ear symptoms. However, the sample of these results is small and thus further research is needed to verify these results.

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